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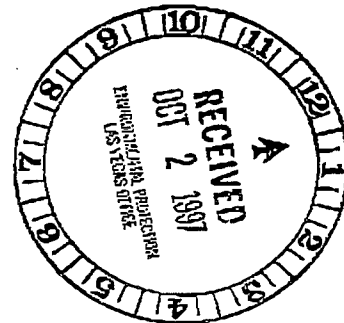
Doug Zimmerman

SUBJECT/COMMENTS:

Pepcon reportsWill bring you the appendix data on  
Friday - Las VegasNUMBER OF PAGES INCLUDING COVER PAGE: 13IF YOU HAVE ANY QUESTIONS CALL: (702) 687-4670 EXT 3127

**FORMER PEPCON PLANT  
PRELIMINARY EVALUATION OF GROUNDWATER  
PERCHLORATE CONCENTRATIONS  
HENDERSON, NEVADA**

**September 30, 1997  
FILE NO. 96189V2**



Prepared for:

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## I. EXECUTIVE SUMMARY

This report presents the methods, findings and conclusions related to the drilling, installation, development and sampling of 6 four-inch PVC monitoring wells at and near the former PEPCON facility. In addition, GES, Inc. sampled two pre-existing monitoring wells near the former PEPCON facility. GES, Inc. retained Weck Laboratories, Inc. to perform laboratory analysis for Perchlorate concentration in seven of the samples. Portions of all eight samples were also transferred to the custody of PEPCON and NDEP for independent laboratory analysis. We encountered measurable concentrations of Perchlorate in the seven samples (excluding the sample taken from LG-226), ranging from 92 µg/L to 600,000 µg/L.

## II. PURPOSE AND SCOPE

A. Background - An explosion on May 4, 1988, demolished the former Pacific Engineering & Production Company of Nevada (PEPCON) facility located near the northeast corner of Gibson Road and Lake Mead Drive in Henderson, Nevada. Prior to the explosion this facility was engaged in the production of chemicals that included oxidizers used as components in solid rocket motors. One of the chemicals produced for this purpose was Ammonium Perchlorate.

In response to an identification of the presence of Perchlorate in Lake Mead and the public drinking water supply of the Las Vegas Valley, Pacific Engineering & Production Company of Nevada retained Geotechnical & Environmental Services, Inc. (GES, Inc.) to perform exploratory services for the purpose of evaluating if Ammonium Perchlorate had impacted the groundwater in the vicinity of the former PEPCON plant. To this end, GES, Inc. installed and, obtained groundwater samples from, six groundwater monitoring wells on and in the vicinity of the former PEPCON plant site.

B. Objective - The purpose of this report is to evaluate Perchlorate concentrations in groundwater at and near the former PEPCON site by installing six

monitoring wells, sampling the groundwater encountered in the wells and providing laboratory analyses for Perchlorate in the collected samples .

**C. Scope of Service** - Pacific Engineering & Production Company of Nevada, in consultation with the Nevada Division of Environmental Protection authorized GES, Inc. to drill, install, develop and sample six monitoring wells on and in the vicinity of the former PEPCON plant. In addition, we sampled groundwater from 2 previously existing wells. This report summarizes the results of evaluations performed to date.

### III. DRILLING AND WELL INSTALLATION METHODOLOGY

**A. Decontamination** - GES, Inc. performed decontamination procedures in between each well location for all equipment in contact with the soil or groundwater. We double rinsed all auger, drilling bits and drill pipe, soil sampling equipment, and the surge block using first a solution of tap water and a biodegradable, phosphate-based detergent, and then clean tap water.

Prior to well development and groundwater sampling, GES, Inc. pumped at least 20 gallons of a biodegradable phosphate-based cleaning solution through the pump and tubing. We then pumped at least 20 gallons of purified water through the pump and tubing.

During decontamination procedures, GES, Inc. obtained samples of the tap water used, the tap water/drilling foam solution and 2 samples of the purified water used. These samples were tested by PEPCON to evaluate background levels of Perchlorate.

**B. Drilling** - GES, Inc. performed the drilling necessary to install the six monitoring wells using a Mobile B-53 combination auger, air rotary drill rig. Well locations are shown on figure 1. We initially installed a conductor casing at each location with hollow stem augers and then converted to air rotary drilling methods. We attempted to drill approximately 10 feet deeper than the depth at which

groundwater was encountered in each boring for the purpose of obtaining sufficient groundwater production to adequately develop the monitoring wells prior to sampling. Where practicable, GES, Inc. obtained soil samples at five-foot intervals for the first twenty feet below the existing ground surface and at approximately fifty feet below the existing ground surface at each well location. Soil samples collected during the drilling operations were obtained by driving a split spoon sampler with a 140 pound Safety Driver with a 30 inch stroke. We utilized both a California sampler and a Standard Penetration Test sampler in the collection of these samples as noted on the exploration logs included in the appendix of this report. Where this sample method was not practical, we attempted to obtain samples of the cuttings expelled from the boring. These samples are being stored in sealed brass sample tubes at 4 degrees Celsius for a 28 day holding period for possible testing at a later date.

**C. Well Installation and Construction** - GES, Inc. installed 6 four-inch diameter PVC monitoring wells. We backfilled the annular spaces with a silica sand pack in the screened portion, sealed the sand pack with bentonite pellets and completed the backfill of the annular space with Neat Cement. The thickness' and depths of installation of these materials, as well as the depth of screened interval, are noted in the exploration logs included in the appendix of this report.

**D. Well Development** - GES, Inc. developed the monitoring wells in general accordance to ASTM Designation D-5092-90, Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers. We used the surging and pumping method of well development. We stabilized the filter pack by mechanical surging followed by purging with a submersible pump. We developed the wells until representative clear water with stable pH, temperature and specific conductivity were obtained. At location F we were not able to obtain clear water due to the nature of the formation encountered there. We developed this well until nearly clear water with stable pH, temperature and specific conductivity measurements were obtained.

E. **Groundwater Sampling** - GES, Inc. performed groundwater sampling in general accordance to ASTM D 4448-85a. Prior to sampling we purged a minimum of five well-volumes of water from each well using a down-hole pump. While purging, we monitored temperature, pH and specific conductivity to ensure that these parameters had stabilized prior to sampling. We obtained five 500 ml samples from each well samples using a disposable Teflon bailers. A new bailer was used for each well. We transferred two of these samples to PEPCON, two to NDEP and one to Weck Laboratories. All samples were transferred under environmental chain-of-custody procedures. During sampling, storage and transportation, all groundwater samples were kept in HDPE containers at a temperature of 4°C or below.

In addition to the six monitoring wells installed by GES, Inc., we obtained samples from two additional existing monitoring wells. (Approximate locations shown on figure 1) One of these wells, LG226 exhibited artesian flow characteristics. We did not purge this well prior to sampling or draw a sample for Weck Laboratories, at the client's request. We did purge well LG225 prior to sampling. The well was completely drawn down during purging. This draw down, combined with the metal construction of the well appeared to create turbid samples. At the clients request, we then repurged the well and obtained a sample directly from the pump.

#### IV. **SUBSURFACE CONDITIONS OBSERVED**

A. **Soil** - Soil conditions encountered during drilling operations were somewhat variable. We encountered sand and gravel mixtures, clays and clay-sand mixtures as well as cemented materials. The soil conditions encountered at each well location are shown on the exploration logs, figures 2 through 8. We encountered predominantly sands, gravels and cemented sands and gravels at sample locations A, B and E. At locations C, D and F, we also encountered clays and clay-sand mixtures at depths greater than 13 feet below ground surface.

B. Groundwater - We encountered groundwater in each of the borings at depths ranging from 43 feet to 89 feet below ground surface. After well installation, the water level in all wells appeared to rise above the level at which it was first encountered during drilling. Initial and final water levels are recorded in the following table. Initial water levels were measured during drilling operations and final levels were measured immediately prior to purging the wells for sampling.

TABLE I  
DEPTH TO GROUNDWATER  
(feet below ground surface)

WELL LOCATION	A	B	C	D	E	F
INITIAL LEVEL	89	71	59	65	87	43
FINAL LEVEL	75	57	41	31	74	29
RISE	14	14	18	34	13	14

#### V. LABORATORY ANALYSIS

The following table represents the analytical results of the samples sent to Weck Laboratories, Inc. by GES, Inc. Weck Laboratories, Inc. is approved by the California D.H.S. for perchlorate analysis.

TABLE II  
ANALYTICAL RESULTS

SAMPLE NUMBER	DATE SAMPLED	DATE ANALYZED	PERCHLORATE CONCENTRATION (µg/L)
E-1	09/11/97	09/17/97	240
F-1	09/11/97	09/25/97	70,000
B-1	09/11/97	09/17/97	8,000
C-1	09/15/97	09/25/97	230,000
A-1	09/15/97	09/25/97	42,000
D-1	09/15/97	09/25/97	600,000
LG225	09/15/97	09/17/97	180
LG225A *	09/15/97	09/17/97	92

\* sampled directly from pump discharge



The following table represents the analytical results from our decontamination media samples. These analytical results were obtained from the American Pacific Corporation laboratory in Cedar City, Utah, using a Dionex Ion Chromatography instrument, calibrated and operated according to the California D.H.S. procedures for perchlorate analysis. PEPCON is a wholly owned subsidiary of American Pacific Corporation.

**TABLE III  
ANALYTICAL RESULTS**

<b>SAMPLE NUMBER</b>	<b>DATE SAMPLED</b>	<b>PERCHLORATE CONCENTRATION (µg/L)</b>	<b>SAMPLE DESCRIPTION</b>
W100	09/08/97	0	PURIFIED WATER
W101	09/11/97	6.8	TAP WATER
W102	09/11/97	INDETERMINATE *	FOAM SOLUTION
W103	09/11/97	0	PURIFIED WATER

\* the physical properties of the drillers' foam interfered with the analytical equipment's ability to measure the Perchlorate concentration in this sample

## **VI. SUMMARY OF RESULTS**

We encountered measurable Perchlorate concentrations in the groundwater at all six installed monitoring wells in addition to one of the pre-existing monitoring wells sampled. These concentrations ranged from 92 µg/L in LG225 to 600,000 µg/L in the monitoring well at sample location D as per the analytical results of Weck Laboratories, Inc.

**VII. CLOSURE**

Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering firms in this or similar localities. No other warranty, either express or implied, is included or intended in this letter.

"I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances."

Respectfully Submitted,  
**Geotechnical & Environmental Services, Inc.**



Shane G. Johnson  
Staff Geologist



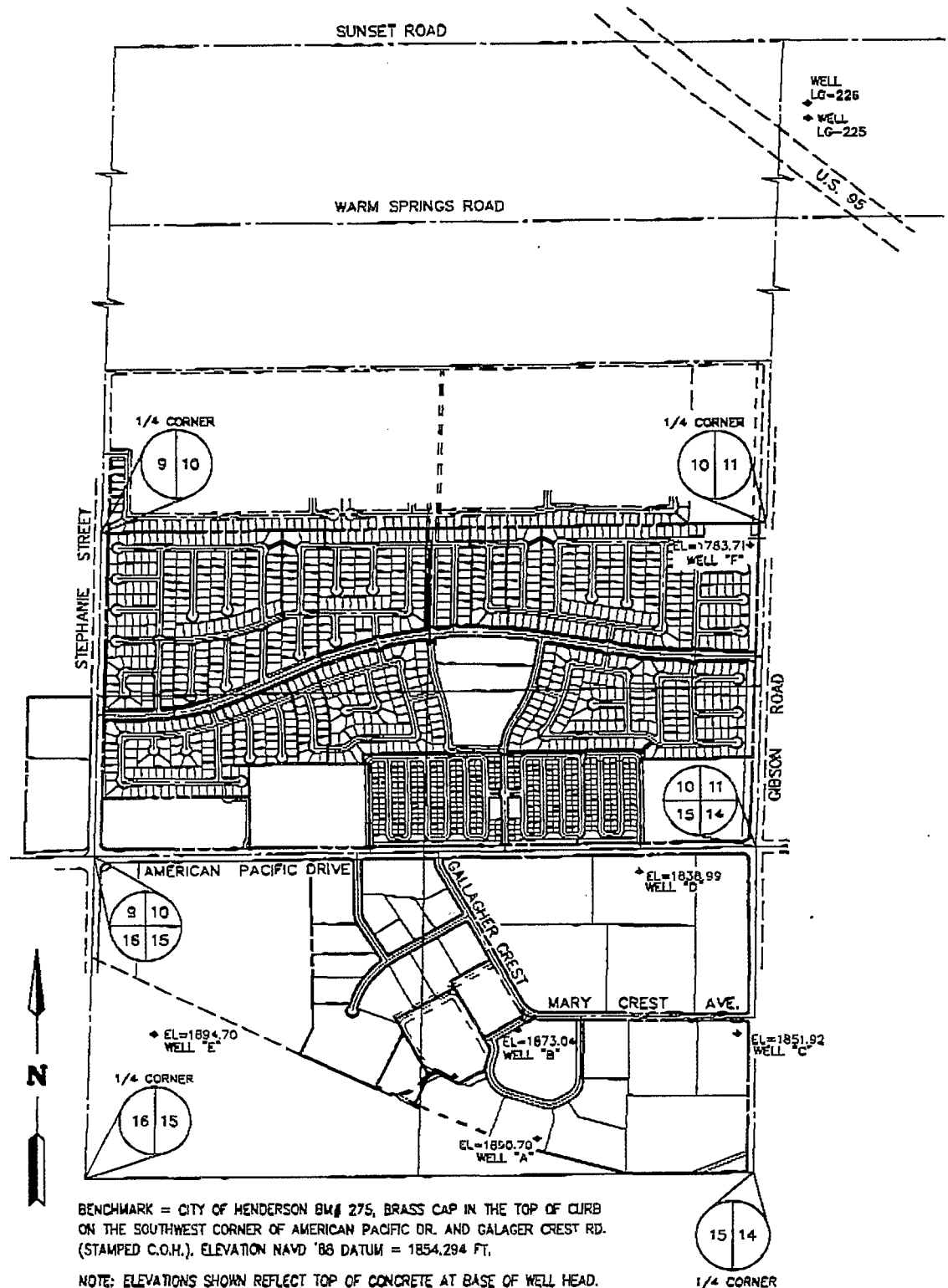
Gregory P. DeSart, P.E., CEM #1172 (expires 12-22-98)  
President

Dist: 6 originals delivered to Jeff Gibson @ American Pacific Corp.

**VIII. APPENDIX**

# GIBSON BUSINESS PARK

## WELL LOCATION EXHIBIT



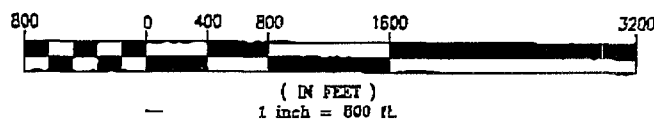
BENCHMARK = CITY OF HENDERSON BM# 275, BRASS CAP IN THE TOP OF CURB ON THE SOUTHWEST CORNER OF AMERICAN PACIFIC DR. AND GALLAGER CREST RD. (STAMPED C.O.H.), ELEVATION NAVD '83 DATUM = 1854.294 FT.

NOTE: ELEVATIONS SHOWN REFLECT TOP OF CONCRETE AT BASE OF WELL HEAD.

NOTE: WELLS LG-225 & LG-226 ARE APPROXIMATE LOCATION ONLY PER G.E.S.

NOTE: SEE ATTACHED SHEET FOR STATE PLANE COORDINATES INFORMATION.

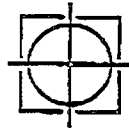
### GRAPHIC SCALE



SCALE: 1" = 800'



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W.O. #503-C375  
File: C375EX06.DOC  
September 30, 1997  
By: TLH  
Checked By: GDR

**SURVEYOR'S NOTE:** The State Plane Coordinates shown hereon are derived from Clark County's Record of Survey recorded in File 88, Page 53 of Surveys. The reference points, which this survey was based upon, were "Whitney 2" and "W51" as shown per said Survey. The coordinates shown hereon are in U.S. Survey feet and are Grid Coordinates rotated and translated to the North American Datum of 1983 (NAD 83), Nevada East Zone, #2701. See the E.S.I. exhibit labeled A320EX62.DWG for the location of the well heads as referenced to local streets within the City of Henderson.

**BENCHMARK** - City of Henderson BM# 275, Brass Cap in the top of curb on the southwest corner of American Pacific Drive and Galager Crest Road (Stamped C.O.H.).  
Elevation NAVD 88' Datum = 1854.294 ft.

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
2000	26719788.77	819909.85	1783.71	WELL "F"
2001	26717131.48	819059.66	1838.99	WELL "D"
2002	26715809.72	819813.04	1851.92	WELL "C"
2003	26715849.02	818114.18	1873.04	WELL "B"
2004	26714962.98	818267.11	1890.70	WELL "A"
2005	26715804.75	815276.80	1894.70	WELL "E"